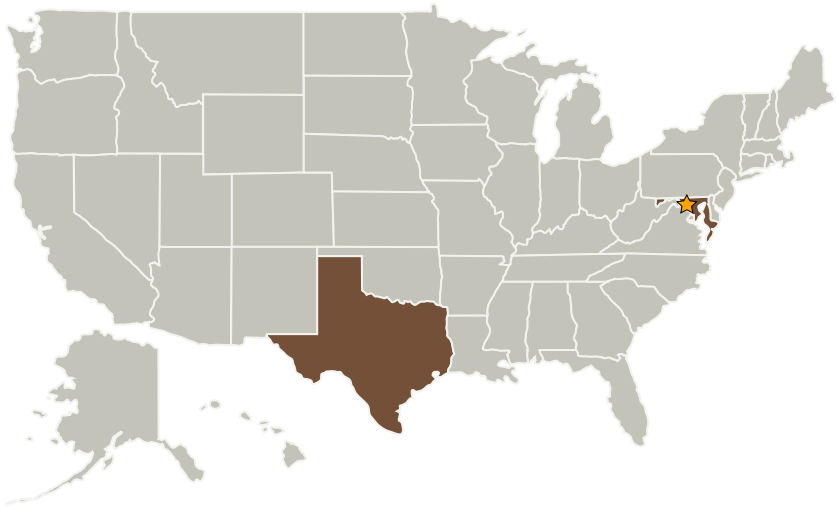
Low Friction Surfaces for Low Temperature Applications, Phase I

Completed Technology Project (2009 - 2009)

Project Introduction

Lunar and other extraterrestrial environments put extreme demands on moving mechanical components. Gears must continue to function and surfaces must continue to slide over a wide temperature range, the low end of which renders most conventional lubricants solidified while the high end vaporizes them, especially in a vacuum. Extremely long service lives are needed, and dust can cause abrasive damage. The solution is to use a high lubricity wear resistant solid, but not even all solid lubricants are suitable for the full range of challenges. We propose to use a novel electrocodeposition process to produce a quasicrystalline coating on the surface of metal parts. Quasicrystals are a unique family of alloys having symmetries found nowhere else. They are exceptionally hard, with low surface energies. Quasicrystalline coatings have been demonstrated to be stable over wide temperature ranges and to have low friction over the entire range. Our process produces solid, high-density, low friction coatings on a variety of metal substrates. The coatings are stable for the long periods needed to achieve long operating lives. They are applied under relatively mild conditions using readily available equipment and can be applied to substrates of any shape or size. In this project we will demonstrate the application of low friction coatings to gear alloys and show their low friction and wear properties over a temperature range that extends from above ambient to cryogenic.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Lynntech, Inc.	Supporting Organization	Industry	College Station, Texas

Primary U.S. Work Locations	
Maryland	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.7 Mechanism Life Extension Systems